Remarks

Objections Under 35 USC §132

The Amendment filed on September 17, 2002 has been objected to as introducing new matter to the disclosure (i.e., the range of one half to two thirds). By the present Amendment, the amendments to the specification contained in the Amendment filed on September 17, 2002 have been deleted.

Rejections Under 35 USC §112

Claims 78-82, 87, 88, 90-93 and 96-98 have been rejected under 35 USC §112, second paragraph as being indefinite. By the present Amendment, the limitations on penetration depth (i.e., penetration depth of one half to two thirds of the thickness) in claims 78, 87, 92 and 97 have been canceled. In addition, the force limitation range (i.e., two to ten times) in claims 79 and 87 has been canceled.

Claims 78-82, 87, 88, 90-93 and 96-98 have been rejected under 35 USC §112, second paragraph, as being indefinite due to the limitations of "5000 Å" and "about". By the present Amendment, claims 81, 88, 92 and 97 have been amended to remove these limitations.

Rejections Under 35 USC §103

Claims 78-82, 87, 88, 90-93 and 96-98 have been rejected under 35 USC §103(a), as being anticipated by Agahdel et al. (US Patent No. 5,402,077) in view of Nakano (JP Hei 3-69131).

Claims 78-82, 87, 88, 90-93 and 96-98 have been rejected under 35 USC §103(a) as being unpatentable over Agahdel et al. (US Patent No. 5,402,077).

The rejections under 35 USC §103 are traversed for the reasons to follow.

Summary of the Invention

The pending claims are directed to an "apparatus for testing semiconductor dice having a plurality of pads". The apparatus (fixture 11-Figure 8) includes a plate for retaining the die (die cavity plate 13-Figure 8), and a clamping mechanism (clamp 89-Figure 8). The testing apparatus also includes a substrate (41-Figure 6) configured to make temporary electrical connections with the die (21-Figure 6) held in the testing apparatus (fixture 11-Figure 8). The substrate (41-Figure 6) includes contacts (61-Figure 6) with raised portions (73-Figure 6) for penetrating pads (27-Figure 6) on the die (21-Figure 6) to a self limiting penetration depth.

The contacts (61-Figure 6) are constructed such that a biasing force with which the clamping mechanism (clamp 89-Figure 8) presses the die (21-Figure 6) and the substrate (41-Figure 6) together is sufficient to cause the raised portions (73-Figure 6) on the contacts (61-Figure 6) to penetrate the pads (27-Figure 6) on the die (21-Figure 6). This is the lower limit of the biasing force. At the same time, the biasing force is selected to be less than a force required for the remaining portions of the contacts (61-Figure 6) to penetrate the pads (27-Figure 6) on the die (21-Figure 6). This is the upper limit of the biasing force.

35 USC §103 Rejections Over Agahdel et al. and Nakano

Agahdel et al. discloses a bare die carrier that includes a substrate 16 having a polymer layer 39 and contact pads 40 (Figure 4) on the polymer layer 39 configured to electrically engage die pads 45 on the die 22. The contact pads 40 include particles 44 (Figure 5)

embedded in a layer of a hard metal 46, which binds the particles 44 to the contact pads 40. In addition, a layer of nonoxidizing metal 48, such as gold, is deposited on the particles 44.

Nakano is directed to a method for forming a probe card for testing semiconductor dice contained on a wafer (Page 2 in paragraph entitled "Field of Industrial Application"). The Nakano probe is adapted to replace a conventional probe card having probe needles (Figures 6 and 7). The window 14 (Figure 1) on the Nakano probe is for aligning the probe card with an integrated circuit chip 24 (Figure 1b) on a wafer. In addition, the Nakano probe includes pointed probe contacts 22 (Figure 1b) formed on a planar protuberance 21 (Figure 1b), which are configured to penetrate pads 25 (Figure 1b) on the integrated circuit chip 24.

As Agahdel et al. is directed to a bare die carrier, and Nakano is directed to a probe card, one skilled in the art at the time of the invention would have no incentive to combine the references in the manner of the Office Action. As support for the combination the Office Action states: "It would have been obvious to one of ordinary skill in the art at the time of the invention to have adapted the point protrusion of Nakano et al for use on the pads of Agahdel et al because one skilled in the art would realize that so doing would enable easy manufacture".

However, ease of manufacture does not appear to be a valid incentive, as other manufacturing problems would surely arise if the point protrusions of the Nakano probe card were substituted for the particles in the Agahdel et al. bare die carrier. Also, the Examiner has a definite advantage in formulating the proposed incentive, as the present disclosure and examination experience can be drawn upon. However, one skilled in the art at the time of the invention does not have this same viewpoint, and would not be likely to make the proposed combination.

Further, the independent claims state that each bump includes a plurality of raised portions or points. In contrast, Nakano teaches only a single pointed probe contact 22 per planar protuberance 21. Although, Agahdel et al. teaches multiple particles 44, one skilled in the art would have no incentive to replace each one with a pointed probe contact 22. Further, there would likely be manufacturing problems from this course of action, which would defeat the proposed incentive.

35 USC §103 Rejections Over Agahdel et al.

The amended independent claims include recitations that are submitted to make the present test apparatus unobvious over Agahdel et al. In particular, the independent claims state that each contact comprises a bump having a "height" on the substrate (antecedent basis is provided on page 15, line 6 of the specification). In contrast, the Agahdel et al. contacts comprise pads 40 in a polymer layer 39 with particles projecting from the pads 40.

In addition, the amended independent claims state that the bump includes "raised portions" (or "points") dimensioned to penetrate into a pad to a penetration depth less than a thickness of the pad". In contrast, Agahdel et al. teaches particles, rather than raised portions or points, for penetrating the die pads 45. With the present arrangement the penetration depth can be more precisely controlled, because the raised portions can be more precisely dimensioned than the Agahdel et al. particles 44 (Figure 5) embedded in a metal 46 (Figure 5). Further, the amended independent claims state that the bump is "dimensioned to limit further penetration of the raised portions into the pad at the force." There is no teaching of penetration limitation using the pad 40 in Agahdel et al. In addition, penetration limitation by the pad 40 is not inherently performed, because the pad 40 is mounted on

a resilient polymer layer 39, and the polymer layer 39 is stated to provide "compliance under pressure" (column 8, lines 52-53).

Conclusion

In view of the amendments and arguments, favorable consideration and allowance of claims 78-82, 87, 88, 90-93 and 96-98 is requested. Should any issues remain, the Examiner is asked to contact the undersigned by telephone.

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June 11, 2003
Date of Signature

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